Household solid fuel combustion for space heating:
Updating emissions estimates to better understand
air pollution, health, and climate change implications

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Key messages

- Residential heating emissions from solid fuel use (wood, coal, etc.) are important from a health perspective, responsible for ~3% of total PM2.5. But they remain poorly characterized in many regions.

- Misclassification is a problem: fuel type, device type, end use, spatial representation. There are fewer nationally-representative surveys available for heating than for cooking, though this will change over time.

- Disaggregation of residential sector emissions is urgently needed, to understand health impacts & policy options.
Method: calculating household heating / ambient PM$_{2.5}$

% ambient PM$_{2.5}$ from heating

% residential PM$_{2.5}$ from heating

PM$_{2.5}$ heating emissions / PM$_{2.5}$ household emissions

GAINS

% ambient PM$_{2.5}$ from household sources

PM$_{2.5}$ household

Ambient PM$_{2.5}$

Concentrations of PM$_{2.5}$

Deaths from AAP

DALYs from AAP

GBD

(TM5, SAT, MEASUREMENTS)

Sources: Chafe et al. 2014, *Environmental Health Perspectives*; Chafe et al. 2015, WHO Report on "Residential heating with wood and coal: health impacts..."
Outdoor air pollution (OAP) from household heating & cooking (2010)

<table>
<thead>
<tr>
<th>Region</th>
<th>Percent of ambient PM2.5 due to household...</th>
<th>Deaths from OAP due to household...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heating</td>
<td>Cooking</td>
</tr>
<tr>
<td>Central Europe</td>
<td>21.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>13.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>12.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Central Asia</td>
<td></td>
<td>0.2%</td>
</tr>
<tr>
<td>High-income North America</td>
<td>8.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>High-income Asia Pacific</td>
<td>0.6%</td>
<td></td>
</tr>
<tr>
<td>Southern Latin America</td>
<td>15.0%</td>
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</tr>
<tr>
<td>North Africa and Middle East</td>
<td>3.3%</td>
<td></td>
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<tr>
<td>East Asia</td>
<td>10.0%</td>
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<tr>
<td>South Asia</td>
<td>26.0%</td>
<td></td>
</tr>
<tr>
<td><strong>Global</strong></td>
<td>12.0%</td>
<td></td>
</tr>
</tbody>
</table>

Emission data sources and inventories

• Situation: Households across all income levels and continents use wood and coal to heat their homes. The emissions impact health & climate

• Goal: Understand PM2.5 (for health) and climate-relevant emissions from home heating sector

• Challenges:
  – Poor data availability from national surveys
  – Difficult to distinguish between various residential fuel uses
  – Overlaps and other end uses make simple splits inaccurate
  – Potential for rapid technology change & fuel switching
  – Less attention to heating than cooking recently
(Relative) lack of data on household heating fuels

Figure 23. **LMICs with available data from national surveys on primary heating fuel use**

Household wood end uses: potential for misclassification

Source: Nick Lam (under review)
(Possible) ways forward for improving heating emissions

- Integrate more local/national survey data as it becomes available (WHO initiative)

- Use heating degree days (HDD) to distribute IEA data within a country

- Assume the difference between household energy use in summer/winter is all due to heating

- Establish a temperature threshold, below which heating “switches on”

Source: Nick Lam (in prep)